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Evaluation of Quality and Cholesterol Level of Eggs of Laying Hens Placed on Drinking Water Fortified with Waterleaf *(Talinum triangulare)* Mucilage

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Abstract

This study was carried out to evaluate the effect of waterleaf *(Talinum triangulare)* mucilage on the quality and cholesterol level of eggs of laying hens. This study was arranged in a completely randomized design with five treatments (T1, T2, T3, T4 and T5) with 0 ml, 50 ml, 100 ml, 150 ml and 200 ml of water-leaf mucilage (WLM) respectively in their drinking water. Forty Nera black hens at 24 weeks of age were randomly allocated into five treatments of 2 replicates with 8 hens per treatment. Data collected were statistically analyzed using a one way of variance (ANOVA) and significant means were separated using Duncan Multiple Range Test. Variables measured were egg weight, shell thickness, shell weight, albumen weight, yolk width, yolk cholesterol and Haugh unit. Egg weight and albumen weight in treatment 2 (50 ml WLM) were significantly higher ($p<0.05$) than other treatments. Yolk cholesterol was significantly reduced in T5 ($p<0.05$) and higher in T1 (control). Shell thickness and shell weight was highest in treatment 5 and yolk cholesterol level was lowest in the same treatment 5 (200 ml WLM) than other treatments. In conclusion, this study showed that up to 200 ml WLM inclusion lowered yolk cholesterol level.

Keywords: Egg Quality; Cholesterol Levels; Waterleaf *(Talinum Triangulare)* Mucilage.

1. Introduction

Eggs are sources of complete protein, which man needs in his diet to enable the body, make new cells and repair damaged ones. Eggs can therefore be a part of a healthy diet. One large egg contains around 6.29g of high quality protein. According to Sefcik [1] dietary protein is vital during certain stages of growth.

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The protein in eggs is a unique type of protein. There are two types of dietary protein: complete proteins and incomplete proteins [1]. Sources of incomplete proteins come from plant-based foods such as beans, peas, nuts and grains. These foods are absent of one or more of the essential amino acids man needs. On the other hand, sources of complete protein come from animal foods, such as meat, chicken, milk and eggs, as well as from soy foods. These contain the nine essential amino acids man needs in his daily diet. The level of animal protein in the food is a primary indicator of the quality of life and standard of living [2].

While it's true that egg yolks have a lot of cholesterol—and so may weakly affect blood cholesterol levels—eggs also contain nutrients that may help lower the risk for heart disease, including protein, vitamins B12 and D, riboflavin, and folate [3]. A solid body of research shows that for most people, cholesterol in food has a much smaller effect on blood levels of total cholesterol and harmful low-density lipoprotein (LDL) cholesterol than does the mix of fats in the diet. Recent research has shown that moderate egg consumption—up to one a day—does not increase heart disease risk in healthy individuals and can be part of a healthy diet [4].

Various food categories as part of a nutritious diet, provide usuable energy and heat to animals and humans through intestinal degradation and biochemical transformations while all sorts of other compounds serve unlimited metabolic functions of organs. One of these categories is fruits and vegetables which have been known to be an excellent source of vitamins and carbohydrates. These two are by themselves, enzymatic co-factors and glycolysis substrates, respectively, among other things [5].

Waterleaf (*Talinum triangulare*) belongs to the plant family *portulaceae.* It is a short-lived perennial herb growing to 30-60cm in height. The leaf is greenish in colour with succulent stem and alternate leaf arrangement. According to the authors in [6] Waterleaf (*Talinum triangulare*) contains an appreciable amounts of protein, carbohydrates, steroids, carotenoids, among others and low level of oil content.

In addition, Leung and his colleagues [7] reported that Waterleaf leaves contain per 100g edible portion: water 90.8 g, energy 105 kJ (25 kcal), protein 2.4 g, fat 0.4 g, carbohydrates 4.4 g, fibre 1.0 g, calcium 121 mg, phosphorus 67 mg, iron 5.0 mg, thiamin 0.08 mg, riboflavin 0.18 mg, niacin 0.3 mg, ascorbic acid 31 mg.

The authors in [8] and [9] reported that dietary fiber content of Waterleaf (*Talinum triangulare (Jacq.) Willd*) has the ability to lower blood cholesterol levels in humans.

Ezekwe and his colleagues [10] reported that nutritionally, waterleaf has been shown to possess the essential nutrients like β – carotene, minerals (such as calcium, potassium and magnesium) pectin, protein and vitamins. The vitamin A content (900*u*g) is comparable to other medium green leafy vegetables. Since it contains substantial amount of nutrients, there is a high indication that *Talinum triangulare* leaves can contribute significantly to the nutrient requirements and health management of poultry [10].

The objective of this study was to evaluate the egg quality and cholesterol levels of eggs laid by laying birds supplied drinking water fortified with the mucilage of Waterleaf (*Talinum triangulare*). The limitation encountered in this research work was the lack of funding as the laboratory analysis was quite expensive for the author.

2. Materials and Methods

The study was carried out at the Poultry Unit of the Teaching and Research Farm, Department of Animal Production, Kogi State University, Anyigba, Kogi State, Nigeria. Anyigba is located in the derived Savanna zone of Nigeria. Waterleaf (*Talinum triangulare*) leaves used were harvested from the mature plants at the Teaching and Research Farm of the Kogi State University, Anyigba, Nigeria.

The harvested waterleaf was washed with clean water, cut into slices and then blended. Two (2) litres of water was added per kilogram of waterleaf to facilitate the extraction of the mucilage during sieving.

Forty (40) Nera Black Layers at twenty-four weeks old were purchased from a reputable breeder and used for the study. They were allotted on similar weight basis into five groups namely T1, T2, T3, T4 and T5 of two replicates each, such that there were four birds per replicate. Waterleaf mucilage was added to drinking water at the ratio of 0:1000 ml, 50:1000 ml, 100:1000 ml, 150:1000 ml and 200:1000 ml in T1, T2, T3, T4 and T5, respectively.

The experiment used a completely randomized design. The birds were housed in deep litter system. Feed and water was supplied ad *libitum*.

Laying performance was evaluated by collecting egg laid daily and the hen-house egg production (HHEP) and hen-day egg production (HDEP) were calculated as:

HHEP = Daily Egg Collected / No. of Initial Layers

HDEP = Daily Egg Collected / No. of Live Layers

Egg weight was determined with a digital electronic balance. Feed intake was obtained but subtracting the weight of left over feed from the quantity served daily. Feed conversion ratio was obtained from the ratio of feed intake : egg weight.

On weekly basis, egg quality was evaluated. Twenty five eggs were selected per replicate for assessment of the internal and external characteristics. External egg qualities determined were; Shell thickness using micrometer screw gauge, Shell weight using an electronic balance and the Egg weight using an electronic balance. The internal egg qualities determined were; Albumen height using a Spherometer, Yolk height using a Spherometer, Albumen weight using an electronic scale and Yolk width using a pair of Vernier caliper. Yolk cholesterol was determined on the 27^{th} and 31^{st} week of age of the layers using the procedure described by [11,12].

3. Results and Discussion

The external quality of eggs laid by hens on water leaf mucilage (WLM) in their drinking water are as shown in Table 1.

The best shell thickness was in T5 which is significantly higher ($P<0.05$) than other treatment groups. This is

not surprising, since water leaf leaves contain per 100g edible portion 121mg calcium according to the proximate analysis record by Leung and his colleagues [7]. Likewise, shell weight was best in T5 (200 WLM) as it is significantly higher in T5 than other treatment groups and the control. But egg weight was significantly higher in T2 (500 WLM) than all other treatment groups and control since T2 had both significantly higher ($P<0.05$) feed intake and water intake as revealed in Table 1 and a good FCR.

Table 1: External Quality of Egg of layers given waterleaf mucilage (WLM)

Parameters	T1 (0:1000)	T2 (50:1000)	T3 (100:1000)	T4 (150:1000)	T5 (200:1000)	SEM
Shell thickness	0.39^{ab}	0.36^{b}	0.35^{b}	0.34^{b}	0.43^{a}	0.02
Shell weight	7.25^{b}	7.25^{b}	7.13^{b}	6.63^{c}	8.00^{a}	0.08
Egg weight	71.40^{d}	74.50^{a}	73.05^{b}	72.25^{c}	72.75^{c}	0.21

a, b, c, d = Means with different superscripts represent significant difference ($p<0.05$)

Table 2 reveals the internal qualities of eggs laid by hens whose drinking water was fortified by WLM. range tests

Yolk width and albumen weight were significantly higher in T2 than other treatment groups and the control. Yolk height was significantly higher ($P<0.05$) in T3 than in other groups.

Albumen height was significantly higher ($P<0.05$) in T4 than other groups followed by T2 and T3 which were not significantly different ($P>0.05$) from each other and from T5 but were significantly higher than the control.

The significantly higher ($P<0.05$) yolk width, yolk height, albumen weight and albumen height in the treatment groups than the control reflect the proteinous content of waterleaf. Leung *and his colleagues* had a record of 2.4g protein per 100g edible protein of waterleaf [7].

Table 2: Internal Quality of Egg of layers given waterleaf mucilage (WLM)

Parameters	T1 (0:1000)	T2 (50:1000)	T3 (100:1000)	T4 (150:1000)	T5 (200:1000)	SEM
Yolk width	0.60^{e}	1.04^{a}	0.93^{b}	0.64^{d}	0.87^{c}	0.05
Yolk height	0.95^{d}	1.11^{c}	1.27^{a}	1.11^{c}	1.14^{b}	0.04
Albumen height	0.75^{d}	0.97^{b}	0.98^{b}	1.13^{a}	0.96^{bc}	0.38
Albumen weight	46.75^{b}	47.88^{a}	45.75^{c}	45.63^{c}	43.75^{d}	0.21
Haugh Unit	83.32^{b}	80.14^{c}	68.55^{d}	102.82^{a}	72.04^{d}	0.54

a,b,c,d. = Means with different superscripts represent significant differences at ($p<0.05$) by Duncan`s multiple

The cholesterol level of egg yolk of layers given WLM are as shown in Table 3. Hens on 200ml WLM (T5) had significantly lowered (P<0.05) cholesterol level than all other treatment groups and the control the two times the cholesterol level were determined. The results show that the higher the waterleaf mucilage (WLM) intake, the lower the cholesterol level of the egg yolk.

Table 3: Cholesterol Level of Egg Yolk of Layers given Waterleaf Mucilage (MLM)

Age of Layers in weeks	Cholesterol Levels					
	T1	T2	T3	T4	T5	SEM
	(0:1000)	(50:1000)	(100:1000)	(150:1000)	(200:1000)	
Week 27	3.21^{a}	2.43^{b}	1.79^{c}	1.63^{c}	1.07^{d}	0.00
Week 31	3.24^{a}	2.38^{b}	1.54^{c}	1.45^{c}	1.77^{d}	0.10

a, b, c, d = Means with different superscripts represent significant differences at (P<0.05)

Oloyede (2005) explained that the phytochemical analysis is very helpful in the evaluation of some active biological components of some vegetables and plants. He also explained that the qualitative and quantitative analyses of water leaf (*Talinum triangulare*) carried out in both dry and wet samples revealed that it contains alkaloids, flavonoids, saponins amongst others. He argued that the presence of these substances shows its possible medicinal and dietary values [13].

Burlon and Ingold in [14] reported that high levels of flavonoids in waterleaf shows that water leaf is good for the management of cardiovascular diseases like stroke, obesity and oxidative stress since flavonoids are biologic antioxidants [14].

In addition, Donald and Cristobel in [15] reported that epidemiological studies have shown that flavonoids and carotenoids intake is inversely related to mortality from coronary heart diseases and the incidence of heart attacks.

Saponins have likewise been reported to be used widely for their effects on ammonia emissions in animal feeding, adding that animal trials have shown that a reduced ammonia level in farming operatives causes less damage to the respiratory tract of animals and may help them to be less vulnerable to diseases [16].

Furthermore, Heikens *and his colleagues* [17] explained that the valuable pharmaceutical properties of *Talinum triangulare* may be attributed to the presence of bioactive compound like alkaloid, which has been used as central nervous system (CNS) stimulant, topical anaesthetic in ophthalmology and powerful pain relievers among other uses and concluded that *Talinum triangulare* leaves can contribute significantly to the health management of man and should be recommended in our daily nutritional intake [17].

4. Conclusion and Recommendations

In conclusion, 50ml and 100ml WLM gave better weight gain, daily feed intake, feed conversion ratio, better hen day egg production, egg weight, yolk width and good albumen height. While T2 (200ml) gave better shell thickness, shell height and a much lowered cholesterol level. It is therefore recommended that WLM be included in layers' drinking water at level at 200ml for low egg cholesterol level. Also, patients who are at risk of cardiovascular problems can be encouraged to take eggs from layers raised on WLM.

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